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ABSTRACT

The test reliability of two tests of family functioning--the Family Environment Scale (FES) and the Family Adaptability and Cohesion Evaluation Scales (FACES-II)--was studied in 111 Anglo American, Black American, and Mexican American Families. The sample included children in grades three to six, as well as adults. The FES was administered to the adults twice, with a one-week interval. FACES-II was administered to the children twice, separated by a week. Item analyses, internal consistency and test-retest reliability coefficients, and factor analyses were conducted. Results indicated that the cohesion, conflict, and active-recreation scales of the FES had more acceptable psychometric characteristics than the FACES-II. The test-retest reliability results were higher than the internal consistency coefficients, indicating that the measures detected reliable variance, but these were not sensitively reflected in the preidentified scales. Both internal consistency and test-retest reliability coefficients varied by ethnic group, with the highest reliability among Anglo respondents. It was concluded that investigators interested in the cohesion, conflict, or active-recreational dimensions of family functioning in minority group populations should use Moos' and Moos' Family Environment Scales. (GDC)

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Comparative Reliability of Two Measures of Family Functioning[1]

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Comparative Reliability of Two Measures of Family Functioning

ABSTRACT

The Family Environment Scale (FES) and the Family Adaptability and Cohesion Evaluation Scales (FACES-II) were given to separate halves of a triethnic sample of adult family members at two times, separated by a week. FACES II was given to all the children two times, separated by a week. Item analyses, internal consistency and test retest reliability coefficients, and factor analyses were conducted on the scales. The cohesion, conflict and recreation scales of the FES were shown to have more acceptable psychometric characteristics than the FACES II. The test-retest reliability scores were higher than the internal consistency coefficients, indicating that the instruments were detecting reliable variance, but these were not sensitively reflected in the preidentified scales. Internal consistency and test-retest reliability coefficients varied by ethnicity. It appears the FES is the instrument of choice in the studied populations.

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A person's family has been shown to be an important influence on health behavior (Baranowski & Nader, 1985a) and health behavior changes (Baranowski & Nader, 1985b). Aspects of family functioning have been shown to be more related to health behaviors than have aspects of family structure (Baranowski & Nader, 1985 a & b).

While many aspects of family functioning have been measured, Moos and Moos (1981) developed a multivariate inventory (Family Environment Scales - FES) assessing ten aspects of family functioning. Olson, Sprenkle & Russell (1979) argued that the two predominant dimensions of family functioning are cohesion and adaptability. Olson, Bell & Portner, (1978) developed measures of these two constructs (Family Adaptability and Cohesion Evaluation Scales - FACES). Fowler (1981, 1982) argued that a second order factor analysis of the Moos items revealed the same two family dimensions propsed by Olson.

Given the importance of these concepts, valid and reliable measures are needed. Moos and Moos (1981) reported modest internal consistency values (0.61 to 0.78) and two month test-retest reliability values (0.68 to 0.86) across the ten scales with their initial development sample. This sample reportedly included families of many characteristics, but internal consistency data were not reported within all subgroups. Few other studies have reported the psychometric characteristics of the FES.

Olson's instrument has received more critical attention. The first version of the FACES (Olson, Bell & Portner, 1978)

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demonstrated acceptable internal consistency values. Three subsequent reports (Alexander, Johnson & Carter, 1984, Bilbro & Dreyer, 1981, Stallworth, 1982), however, pointed out conceptual and methodological problems, questioning the validity of FACES I. Olson, McCubbin and associates (1983) developed a shorter version for which they reported acceptable internal consistency (0.87 for cohesion, 0.78 for adaptability) and test-retest reliabilty (0.83 for cohesion, 0.80 for adaptability). No further psychometric characteristics of the FACES II have appeared in the literature. Olson and codevelopers have not responded to the critique about the multifactorial nature of their two constructs (Alexander et al, 1984, Bilbro & Dreyer, 1981).

Acceptable reliability needs to be domonstrated for any new population with which an instrument may be employed. This paper reports on the psychometric characteristics of both the Moos FES and the Olson FACES II in a group of adults and children from three ethnicities in Galveston, TX.

METHODS

Design. Data were collected as part of a larger study on the validity and reliability of self report measures of diet and exercise. Within ethnic groups the adults were randomly assigned by family to complete the FES or the FACES II. Because of its simpler language and fewer (thirty) items all children were assigned FACES II. The instruments were initially administered at an afternoon session at which the families were trained to obtain diet, exercise and urine measures on a daily basis. The same instruments were readministered one week later when the family came to a morning clinic for assessment of blood pressure, body

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composition and physical fitness. The instruments were administered in groups of one to four families at a time.

_Sample. Families were recruited for this study if adults and children lived in the same household, had a child in the third to sixth grades, were one of three ethnicities (Anglo-, Black-, or Mexican-American) and were healthy (i.e. no participating family member had a chronic illness). All the families were volunteers. The methods for family recruitment of this sample have been reported elsewhere (Hooks, Baranowski, Vanderpool & Nader, 1985).

_Instruments. Form R of the FES was employed in its original (Moos and Moos, 1981). The FACES II was employed in its original format as well (Olson, McCubbin and Associates, 1983). For the adults, almost all cases were self administered. If an adult was having difficulty, the items were read and interpreted as necessary. Among children, the person conducting the initial training session usually assisted by reading the items and interpreting words which were not clear.

__Analyses. Item analyses with assessment of internal consistency (Cronbach's alpha) and test-retest reliability (the unbiased estimator from the strictly parallel model in SPSS) were conducted for adults and children separately and for each grade within each instrument for the two administrations, separately. For adults and children separately a principal components analysis with varimax and oblique rotations were conducted.

If the scales in these instruments are reliable, we would expect to obtain the following: scale specific item-total correlations of 0.15 (preferably 0.20) or higher, with no negative item-total correlations; scale specific internal consistency

measures of 0.80 or higher with none below 0.70; test-retest reliaility (T-RT) values to be somewhat lower (but approximately 0.80) than the internal consistency measures since the interval of a week between assessments would permit some real change to occur which would lower the true reliability from a measure of internal consistency. For the factor analyses we would expect that the same number of factors would be produced in our analyses, and the newly obtained factors would closely replicate the instrument's original set of items included in each factor. (In regard to the Moos FES, since we had a small sample, we decided to conduct five separate factor analyses each of which included the items from two of the scales in the original FES. In this way, our sample was adequate for the number of items included in the analysis, and only two factors should result per analysis.)

RESULTS

_Sample_Characteristics. Data were obtained on 111 families. Acceptable family functioning data were obtained on 131 adults and 87 children. Distributions of participants across age, ethnicity, gender, and grade characteristics are found in Table 1.

***** TABLE 1 about here *****

_Item_Analyses - FACES_II. An uneven pattern resulted for the internal consistency and test-retest (T-RT) reliabilities for the cohesion and adaptability scales at the pre and post assessments for the whole sample and for specific subsamples (see Tables 2 and 3). In general, neither the cohesion nor the adaptability scales consistently exceeded the desired value of 0.80. Of greater note is that the T-RT values are consistently higher than the internal consistency measures. In general, the

adults have higher alpha and T-RT values than the children; female adults have higher values than males; and sixth graders have higher values than 3rd, 4th, or 5th graders. The item-total correlations from these analyses revealed several negative item-total correlations.

***** TABLES 2 and 3 about here *****

Factor Analyses - FACES II. A factor analysis was conducted on the FACES II items across all adult participants. The varimax and oblique rotations produced similar factors, so the varimax rotated factors are described here. Ten factors were obtained with an eigenvalue of 1.0 or higher. The items loading 0.4 or higher did not reveal a consistent pattern of separate cohesion and adaptability factors or subfactors. For example the first factor had seven items, four from the cohesiveness scale and three from the adaptability scale. Eight of the 30 items loaded high on two or more factors using the varimax rotation. Fifteen of 30 items loaded high on two or more factors using the oblique rotation. These factors in no way corresponded to the scales derived by Olson and colleagues.

There is reason to believe that a factor analysis should be constrained to the number of factors defining the items inserted into the factor analysis (Walkey, 1983). When constrained to two factors, the factors revealed the same, apparently random combination of items from the original cohesiveness and adaptability scales. There was an insufficient sample to conduct separate factor analyses within ethnic or gender subsamples of this study.

Item Analyses - FES. The reliability analyses for the

Moos Family Environment Scales (FES) provided a pattern of results that varies by scale (see TABLE 4). The two scales of greatest interest for research on families and health behavior change are cohesiveness and conflict. The values on these scales come closer to the acceptable ranges than values on the other scales, or the original values on the FACES II. It is disconcerting that the test-retest reliability scores are consistently higher than the internal consistency scores. The values for the Blacks on these two scales are not as high as those for the Anglos, but consistently higher than those for the Mexican-Americans.

*****TABLE 4 about here*****

Factor Analysis - FES. In all cases factor analysis revealed more factors than the two characterizing the items inserted in the analysis. In virtually every case, however, the empirically obtained factors identified subsets of items in one or the other of the original two scales inserted, or the items from one scale were negatively loaded on a factor with positively loaded items from the other scale. A large number of items in each analysis did not load on either factor. Since all items were not factor analyzed simultaneously, it is not clear what other factors might appear from correlations among items not included in the same factor analysis.

DISCUSSION

Neither instrument demonstrated all the desired psychometric properties. The internal consistency values were lower than those reported by Moos and Moos (1981) or Olson et al (1978). This low internal consistency indicates that each scale is either measuring multiple constructs, or the one construct poorly. The

consistently higher test-retest correlations than the internal consistency values also indicates that the items are consistently measuring some phenomena, but not the supposedly unidimensional construct in each scale. The factor analyses reveal the items are measuring multiple constructs, other than those proposed in the original scales. In the case of FACES II, these new dimensions correspond in no way to the original dimensions. In the case of FES, the dimensions identify subscales of the original dimensions. It is not clear, therefore, what FACES II is measuring in this population. Similar to the comments of Bilbro and Dreyer (1981) and Alexander et al (1984) in their assessment of FACES I, the multiple subscales in the FACES II pose conceptual and empirical problems. Does it make sense to combine these several subscales into a unified measure? Although Olson reported combining items from several scales to create the cohesion scale, there is no evidence that Moos and Moos did this. Perhaps one or another of the FES subscales will more likely predict other events than the comprehensive scale and therefore may be more useful than the comprehensive scale in understanding health related behaviors. Further conceptual and psychometric research may be necessary to clarify the concepts to which these subscales correspond.

Another disconcerting aspect of these data is the inconsistency in the internal consistency values across ethnic groups. Typically (but not always) the iternal consistency values were highest among Anglos. We cannot say why this occurred. Three possibilities come to mind. Perhaps the minority group members have more difficulty answering these kinds of items because of differences in language, reading ability, or lack of

familiarity with these kinds of scales? Perhaps minority group members require different items which specify more culturally relevant behaviors to specify the same conceptual domain? Or, perhaps these aspects of family functioning do not measure meaningful aspects of minority group family life? In a personal communication, Olson reported that the FACES II was created for use with two parent nuclear families and it would not be appropriate for use with other family structures. This may account for the lower reliability in the Black-American families. More work must obviously be done to develop scales appropriate to meaningful aspects of minority group family functioning.

In conclusion, investigators interested in the cohesion, conflict or active-recreational dimensions of family functioning among minority populations at this time should employ the Moos and Moos instrument. These scales have reasonably acceptable psychometric properties in most of the subgroups analyzed. Investigators interested in other aspects of family functioning need to compare the internal consistency of several measures of family functioning in the populatons of interest to them, and select that measure with the most acceptable psychometric characteristics.

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TABLE 1. Ethnicity, gender and grade characteristics for adults and children completing the Family Environment Scales (FES) and Family Adaptability and Cohesion Evaluation Scales (FACES II)

		FES	FACES II	
TOTAL		ADULTS	ADULTS	CHILDREN
		69	62	87
ETHNICITY	ANGLO	18	17	20
	BLACK	38	36	53
	MEXICAN	13	9	14
GENDER	MALE	22	22	38
	FEMALE	47	40	49
GRADE	THIRD	--	--	24
	FOURTH	--	--	24
	FIFTH	--	--	23
	SIXTH	--	--	16

TABLE 2. Internal consistency and test-retest reliability of FACES II scales for several subsamples of adults

	COHESION (16 ITEMS)				ADAPTABILITY (14 ITEMS)			
	N	PRE	POST	T-R	N	PRE	POST	T-R
TOTAL	62	.643	.680	.727	62	.714	.723	.783
ANGLO	17	.759	.764	.838	17	.643	.625	.748
BLACK	36	.556	.619	.653	36	.572	.667	.698
MEXICAN	9	.607	.714	.823	9	.874	.855	.923
MALE	22	.500	.593	.683	22	.415	.654	.694
FEMALE	40	.699	.721	.765	40	.787	.754	.825

TABLE 3. Internal consistency and test-retest reliability of FACES II scales for several subsamples of children.

	COHESION (16 ITEMS)				ADAPTABILITY (14 ITEMS)		
	N	PRE	POST	T-R	N	PRE	POST	T-R
TOTAL	87	.462	.486	.626	87	.430	.494	.675
ANGLO	20	.495	.568	.724	20	.685	.782	.874
BLACK	53	.479	.462	.642	53	.054	.191	.392
MEXICAN	14	.172	.422	.440	14	.630	.636	.825
MALE	38	.504	.408	.634	38	.555	.702	.800
FEMALE	49	.423	.544	.644	49	.301	.139	.490
GRADE 3	24	.279	.157	.466	24	.369	.412	.669
GRADE 4	24	.468	.627	.728	24	.219	.591	.675
GRADE 5	23	.356	.394	.527	23	.484	.304	.631
GRADE 6	16	.616	.666	.797	16	.676	.735	.839

TABLE 4: FES SCALES - Measures of Reliabiltiy.

MOOS SCALES

CATEGORIES OF SAMPLE	N	COHESION PRE	COHESION POST	COHESION T-RT	EXPRESSIVENESS PRE	EXPRESSIVENESS POST	EXPRESSIVENESS T-RT	CONFLICT PRE	CONFLICT POST	CONFLICT T-RT
TOTAL	69	.71	.75	.82	-.05	.39	.52	.65	.73	.82
MALES	22	.58	.75	.71	-.71	.51	.42	.59	.71	.82
FEMALES	47	.75	.75	.86	.10	.18	.38	.69	.75	.82
ANGLOS	18	.87	.90	.91	.41	.76	.70	.78	.82	.90
BLACKS	38	.68	.66	.79	-.49	.32	.34	.65	.68	.77
MEXICANS	13	.49	.47	.75	-.12	-1.60	-.00	.33	.67	.74

CATEGORIES OF SAMPLE	INDEPENDENCE PRE	INDEPENDENCE POST	INDEPENDENCE T-RT	ACHIEVEMENT PRE	ACHIEVEMENT POST	ACHIEVEMENT T-RT	INTELLECTUAL PRE	INTELLECTUAL POST	INTELLECTUAL T-RT
TOTAL	.42	.65	.59	.52	.69	.60	.55	.65	.71
MALES	.29	.73	.62	.47	.77	.67	.36	.62	.65
FEMALES	.45	.57	.60	.56	.63	.58	.61	.66	.75
ANGLOS	.68	.88	.81	.69	.78	.76	.71	.81	.83
BLACKS	.24	.47	.42	.52	.61	.48	.46	.49	.65
MEXICANS	.34	.38	.64	.24	-.34	.41	.55	.64	.77

CATEGORIES OF SAMPLE	ACTIVE-RECREATIONAL PRE	ACTIVE-RECREATIONAL POST	ACTIVE-RECREATIONAL T-RT	MORAL RELIGIOUS PRE	MORAL RELIGIOUS POST	MORAL RELIGIOUS T-RT	ORGANIZATION PRE	ORGANIZATION POST	ORGANIZATION T-RT	CONTROL PRE	CONTROL POST	CONTROL T-RT
TOTAL	.63	.70	.78	.55	.81	.76	.58	.73	.79	.41	.55	.64
MALES	.49	.74	.81	.63	.84	.83	.50	.80	.83	-.35	.50	.50
FEMALES	.68	.67	.79	.48	.78	.71	.62	.68	.78	.55	.52	.68
ANGLOS	.77	.82	.87	.65	.88	.84	.71	.84	.86	.59	.66	.77
BLACKS	.46	.65	.72	.52	.83	.73	.51	.66	.74	.32	.52	.61
MEXICANS	.69	.52	.83	.69	.57	.81	.54	.71	.84	-.02	.18	.53

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